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FOREST INSECT INVESTIGATIONS

PLAN OF OPERATION FOR CONTROL OF THE MOUNTAIN PINE BEETLE IN THE LODGEPOLE PINE STANDS OF THE MADISON NATIONAL FOREST

By
James C. Evenden
Entomologist

Forest Insect Field Station
Coeur d'Alene, Idaho
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INTRODUCTION

Barkbeetle control projects must be instituted on a definite plan of organization if efficient results are to follow. The following plan of operation has therefore been prepared to stress the importance of this fact, hoping that it will prove to be of some assistance to the officers charged with the responsibility of the Madison project during the coming season. The writer does not desire this plan to be adopted without question, as it is fully realized that there are improvements that can no doubt be made. However, it should be adopted in its entirety or in part, or discarded and a better one developed. The different phases of this plan are not all untried innovations, as most of them have been successfully instituted on other projects.

The need for some portions of this plan may be questioned as being unnecessary or too detailed for such projects. In explanation as to their need it can be said that all of the records, etc., called for in this plan are essential in the proper and efficient administration of a project of this character. There are two distinct phases to problems of barkbeetle control which are closely related. These two phases are the development of more efficient and economical methods of control, and the improvement of administrative technic in handling control projects, which also tends to greatly reduce the cost of institution. To meet the first obligation

the Bureau of Entomology is directing practically its entire effort towards the development of more economical and efficient methods of control. Members of the Forest Service have also contributed valuable thought and assistance towards this end. In complying with the second requirement it is only by keeping rather detailed cost and production records that a control project can be correctly analyzed and steps taken to eliminate or strengthen the weak spots in its administration. The discussion of some of the items within this plan is no doubt unnecessary, as they are perhaps the logical lines which anyone would follow in the organization of such a project. However, to make this plan as complete as possible, these points have been included, but with the realization that many of them are already fully understood by the officers in charge.

SIZE OF CONTROL ORGANIZATION

The most efficient organization for each of the different areas for which control work is planned is a difficult problem to determine, as there are many different factors to be considered. Though the burning method of control as now practiced permits the continuation of the work until such time as the insects start to emerge, there still remains a time element which must be considered. Late springs and bad weather conditions give a relatively short working season of approximately 30-40 days. This condition often requires that the work be pushed to a degree that is beyond the maximum efficiency of an organization. The number of trees to be treated and the intensity of the infestation will have a material bearing on the size of the organization required if the work is to be completed in the time allotted. With numerous large groups of

infested trees the output per man day will be increased, while with a scattered infestation this production will, of course, be lowered and a larger organization required. When the actual status of an infestation within an area is not definitely known, it will be found to be more efficient to start with a small organization. As the work develops, the actual spotting of the infested trees being pushed as rapidly as possible, the organization can be increased to a size sufficient to care for the situation within the time allotted.

NUMBER OF CAMPS REQUIRED

The determination of the number and location of camp sites is often decided by the question of roads, fuel, and water supply. The most advantageous camp sites are, of course, in the center of the most heavily infested areas, which are difficult to select before a region has been spotted. It may often be found to be expedient to locate a temporary camp for the spotting crews a week or ten days ahead of the actual treating crews. When the spotting has progressed to a certain point, permanent camps can then be located near the heaviest centers of infestation. However, as stated, camp locations are more often governed by transportation, fuel and water. A greater efficiency will be secured from larger and fewer camps because of reduced overhead, cooks, transportation, etc. However, the value of this reduction in nonproductive labor must be weighed against the effects of walking the men long distances or over rough terrain to their work.

The expense of moving a camp from one site to another must be compensated for by a proportionate increase in production in order to make such action justifiable. It is believed it will be more economical to

have one large camp which will need be moved once during the season than to have two small ones for the entire period.

CAMP ORGANIZATION

All control projects should be under a project manager and each camp in charge of a camp manager, who is directly responsible to the project manager. Whenever possible such managers should be forest officers for reasons readily understood. The camp manager will be in direct charge of the camp and responsible for the action of all spotting and treating crews working from it.

Though spotting crews work independently from the treating organization, it should be understood that they are under the supervision and direction of the camp manager. They will take orders from him relative to the areas he desires to have spotted and will be expected to assist the other men in the establishment and moving of camps.

The preparation by the project leader of detailed memoranda of instructions for camp managers, chief spotters, packers, teamsters, etc., will be found to be a good policy to follow. Such memoranda will contain information relative to the duties of these men, their responsibilities, the methods to be followed and reports to be submitted. It will be found that through their use many misunderstandings will be eliminated.

CAMP EQUIPMENT

In this plan no attempt has been made to outline the necessary equipment which should be available in all camps. This equipment varies for different regions and what is necessary in one district would be inadequate or superfluous in another. However, there are a few essential

items which the writer feels should be included in any list of camp equipment. It is felt that for each camp there should be a 10x12 tent for the camp manager to serve as his sleeping quarters and as an office tent where he can have a certain amount of privacy in order to keep his time slips and production records up to date. This tent should also be provided with an extra bunk to care for visiting forest officers. It is also believed that each bunk tent should be provided with a stove rather than to follow the practice of having one community tent so equipped. A stove in each bunk tent will afford greater comfort to the men in wet and cold weather and insure better health conditions. Each camp should be provided with adequate first-aid equipment. This equipment should include a large supply of unguentine, or similar substance, for the treatment and prevention of oil burns, if oil is being used in the treatment of the infested trees. Bunk tents, bedding, kitchen equipment, etc., must be sufficient to care for the organization of each camp. The benefits of a comfortable camp will be realized in better health conditions and a corresponding greater production of labor.

Treating Crews

The equipment required for the actual treating of infested trees varies with the method used. As both the burning-standing and felling methods of control are planned for this project, equipment for both will be necessary. With the burning-standing method, the spray tanks, necessary extensions, repair parts, tanks for carrying oil on pack horses, are of course essential. Repair parts must consist of an adequate supply of gaskets, extra rubber hoses, and shut-off parts, as the action of the oil

destroys rubber in a very short time. Pack horse tanks for the transporting of oil into the woods were developed in Region 4 last season, which apparently gave good satisfaction. The use of these tanks permits the oil to follow the burners very closely, and eliminates lost time in refilling the spray tanks. A small, light portable oil pump should be available at each camp to transfer the oil from the barrels into the pack-horse tanks or spray tanks. Each burner should also be equipped with a pair of light pliers for tightening extensions, etc. The spray pump that has given the best satisfaction in Region 4 has been the Smith Banner Pump, equipped with a specially designed nozzle. The number of these spray pumps that will be required will, of course, vary with the organization. If the spotting and treating are conducted as separate operations, then less pumps will be required than if the spotting crews are equipped for treating. A combination spotting and treating crew of 6 men, including the packer, should have 3 pumps. It is seldom in an organization of this size that there will be a need for four pumps. When the burning is performed as a separate operation each man is equipped with a pump.

For the felling and burning method, saws, axes, single jacks and wedges are necessary. If the logs are to be skidded into decks for burning, then a skid horse with chain and tongs are an essential part of the equipment.

The combined use of these two methods, either in connection with the spotting or subsequent to it, will of course require complete equipment for the practice of both.

Spotting Crew Equipment (5-man crew)

100 Spotter's Daily Reports
12 Spotter's Weekly Reports
1 compass, F.S. Standard, with staff
1 tally register
1 map of forest area, ½" scale or larger
35 map sheets, Form 878
1 aluminum holder, 8½x11"
5 hand axes, with sheaths
10 lbs. tacks
3000 cloth tags, 4x6"
1 doz. pencils and erasers, 4H
Colored pencils
Carbon paper
1 box lumber crayon, soft black
1 canvas carrying case

Combined Spotting and Treating Crew Equipment (6-man crew)

100 Spotter's Weekly Report (used as daily report)
1 compass, F.S. Standard
1 Tally Register
1 Map of forest area
5 hand axes, with sheaths
1 box lumber crayon, soft black
3 spray tanks
2 9-foot extensions
1 extra nozzle (with crew)
1 extra hose (with crew)
1 extra nozzle parts (with crew)
Extra gaskets (all sizes, with crew)
1 light felling saw 5½' sheathed, with handles.
4 ~~light~~ axes 3½# D.B.
1 single jack
1 light felling wedge
2 pack horses
Oil tanks to carry oil (4-5 gal each in 2 sacks
Rack to carry spray tanks when not in use.
1 carrier - timber

Have two copies 25 mimeographed

Camp Manager's Equipment

Time book
Time slips
Stationery
Envelopes
Camp Manager's Weekly Reports
Crew Foreman's Weekly Reports
Pencils
Horse contracts
Man contracts
Compensation forms
Etc.

SPOTTING

The importance of spotting in its relation to a control project cannot be over emphasized. Spotting is the term applied to the location and marking of beetle-infested trees for treatment. It is not an extremely technical task but is one that requires a certain amount of training and experience if the work is to be efficiently performed. It has been found that men who have keen minds and observing eyes make the best spotters. Men should be selected who are interested in the work, and who will realize that the first essential step in a barkbeetle control project is the proper location of the infested trees. Furthermore, these men should not be released to the task of spotting until they have had sufficient training or instruction to give them confidence in their work. When proper and careful instruction is given to these men they will be impressed with the importance of their part of the project and better spotting will follow. However, spotters must be men of sufficient judgment and intelligence to absorb the instructions given to them, or all instruction regardless of how detailed will be lossed. Spotting is hard work and men are required who are capable of walking long distances every day.

Though various methods of spotting have been tested, the only plan that has given complete satisfaction, is the 100 per cent survey. These surveys are conducted by a compassman, or chief spotter, and an even number of spotters. In lodgepole pine stands, a 5-man spotting crew can be effectively used. A 100 per cent survey is secured by a spotting crew stripping an area on a paced compass line. The compassman, or chief of party, is held responsible for the compass work, pacing,

construction of a map showing the number and location of infested trees, and the proper marking of the infested trees for treatment. Each spotter is held responsible for the location and marking of all infested trees within a strip on one side of and parallel to the course of the compassman. The importance of the map prepared by the chief spotter cannot be over estimated. When spotters' maps are accurately prepared the treating crew foreman have no difficulty in relocating the marked trees which materially increases the daily output. Only necessary data should be shown and the little details that are of no real value but only serve to complicate the reading of the map should be omitted. It is necessary for the chief spotter to prepare copies of these maps for the camp manager and for each treating crew working in the area, as well as one for the office files of the Forest if it is so desired. With the exception of the original, these additional maps may be carbon copies which are made with little extra work.

There are various methods of marking infested trees for treatment varying from a mere blaze to the use of a paper or cloth tag. The use of a white tag made from sign painter's cloth has given very good satisfaction in the past, however, it is possible that a more satisfactory and cheaper material can be developed. The advantage of these white cloth tags is that they can be seen very easily for a rather long distance. Each infested tree is marked with one of these tags on which is written, with lumberman's crayon, the crew symbol and the tree number, with the initials of the spotter in the lower righthand corner. Each spotter will carry his own supply of tags which, with the exception of the tree number, will have been previously prepared with the required lettering. When an infested tree is located the spotter stops the compassman by calling "bugs" and if the tree is to

be marked, calls to the chief spotter for a number. The number is then placed on the tag which is fastened to the tree with a tack in each upper corner. On the side opposite the tag the tree should also be blazed and numbered. This blaze will take but a moment and will be found to be of value in relocating the tree, as a small per cent of the tags are sometimes destroyed by deer and squirrels, and it also places a mark on both sides of the tree. When marking a group of trees the tags should be faced to the outside so that the group can be seen from all angles. By securing the tree numbers from the compassman, or chief spotter, consecutive numbers are used and confusion avoided.

It has been found that a strip one chain in width is all that a man can efficiently cover. As there is seldom any foliage discoloration of beetle-infested lodgepole pine during the month of May, and pitch tubes are often very difficult to see, the strip can only be of such width as to permit each spotter to view rather closely the trees within his assigned area and not retard the progress of the compassman.

Though, as stated, it has been rather generally demonstrated that the 100 per cent survey for insect control projects is the most satisfactory, there are conditions that justify a deviation from this policy. Such deviations must always be tempered by the best judgment of the project manager. In addition to the map he is obliged to prepare, the chief spotter will also keep the Spotter's Daily Report and the Spotter's Weekly Report.

DETERMINATION OF TREES TO BE MARKED

In considering the importance of careful spotting, it will be found that there are two distinct phases of the work. These are: (1) the location of all infested or attacked trees within an area; and (2) the proper marking of them for treatment. The location of attacked trees is but a

mechanical operation which, if one is alert, can be made nearly 100 per cent effective. The problem of determining if a tree showing the external signs of a barkbeetle attack should be marked for treatment often offers more serious difficulties.

The insect we are combating is known as the mountain pine beetle (Dendroctonus monticolae), which attacks and kills healthy mature western white pine, western yellow pine, lodgepole pine, sugar pine, white-bark pine, and sometimes Engelmann spruce when in association with infested pine. The adult insects are rather stout, black cylindrical barkbeetles, averaging a trifle over one-fifth of an inch in length. These beetles bore through the outer bark and construct long perpendicular egg galleries directly beneath the bark, slightly grooving the wood and extending up the tree. At the bottom or start of these galleries, which vary in length from 12 to 30 inches, there is usually a slight crook of an inch or more. Eggs are deposited along these galleries which soon hatch into small, white grubs or larvae. While feeding, the larvae excavate individual mines at right angles to the egg gallery, which are exposed on the surface of the inner bark. When mature the larvae construct a small cell at the end of the larval mine in which the transformation to the new adult takes place. During this transformation the insect goes through what is called a pupal stage, and the small cell is termed a pupal cell.

When the transformation is complete the new adults may bore away the intervening bark between cells and congregate beneath the bark for some time before emergence, or emergence holes may be constructed through the outer bark directly from the pupal cells. When emerging after congregating together several insects may use the same emergence hole, or

quite often advantage is taken of cracks in the bark, etc. The emergence of this insect occurs during July and August, and the attacks are made during this period. Under normal conditions, the winter is passed by the insect in an immature larval stage, however, both eggs and adults are often found.

Insect-attacked trees are located by the presence of small pitch tubes at the mouth of the entrance hole, discolored foliage, woodpecker work, or boring dust at the base of the tree. Pitch tubes are not always present, as when the attack is extremely heavy there are only a few small ones to be seen, so one must watch carefully if this external evidence of infestation is to be seen. A few large pitch tubes are usually, but not always, an indication of a pitched-out attack. Fresh woodpecker work is a true indication that there were and probably still are insects beneath the bark. However, it does not prove that the insect is the mountain pine beetle.

Faded foliage can be used as a guide to insect-attacked trees, but as the degree of fading will vary for different season, exposures, etc., it must always be supplemented by an examination of the tree. There is no infallible rule which can be given for the proper marking of trees from external evidence. It will be necessary to examine every insect-attacked tree by removing a piece of bark. If the tree has been killed by the mountain pine beetle and there are undeveloped mountain pine beetle broods beneath the bark, it should be marked for treatment. When present The overwintering parent adults will be found in the top of egg galleries. Normally they will be dead, but do not mark trees for treatment on the strength of these old adults, for though alive they are of very little, if any,

importance. The new adults vary in color, appearing first as pure white to brown and then to black prior to emergence. Many trees may perhaps be found which are attacked on one side only. Where insect broods are present such trees should be marked for treatment.

The safest method to follow in separating the work of the mountain pine beetle from associated barkbeetles which may be found attacking weakened trees, tops of infested trees, etc., is the character of the gallery pattern. The work of the mountain pine beetle is very distinctive and can easily be separated from all other barkbeetles. All Dendroctonus egg galleries are packed solid with boring dust, while those of Ips and other species are open and free from dust.

METHODS OF CONTROL

There are two variations in the burning method of control for the mountain pine beetle in lodgepole that could be used in connection with this project. These are the burning-standing and the felling and burning, both of which can no doubt be effectively used in certain areas. Before discussing their adoption it would be well to discuss in more detail the actual mechanics of these methods.

Burning-Standing Method

The burning-standing method which has been used in region 4 during the past two seasons is accomplished by spraying the trunks of the infested trees with a fuel oil and burning them while standing. This method is effective in destroying all insects beneath the bark on that portion of the bole which has been rather well charred or blackened by the flames. The bark must be rather thoroughly charred in order to secure a temperature of sufficient intensity to destroy the insects

beneath. With large trees having thick bark at the base it is necessary to use more oil and char the bark more deeply.

The height to which the attacks extend up the trees varies considerably, and there seems to be no definite rule that can be applied. The presence or absence of pitch tubes cannot always be considered as indicating the height of the infestation. With heavily infested trees the pitch tubes are often absent, or are so small that they cannot be seen in the upper portion of the tree. However, when the size of the tree as well as the presence of pitch tubes is taken into consideration, the height of the infestation can often be fairly accurately determined. When trees are felled for treatment, they should be treated up to a point where the sapwood is no longer blue. This is a "fool-proof" rule that can be followed when such methods of treatment are employed. However, in using the burning-standing method, it will often be necessary to consider many trees as being infested up to a 5 or 6 inch top diameter, and to treat them accordingly. When trees are not treated to the height of the infestation, the method can only be considered as being as efficient as the per cent of infested bark surface that has been destroyed.

There is a certain technique which must be developed by the men burning the infested trees, if the best results are to be secured. With the equipment used last season, the most effective results were attained by the burners working in pairs, and by having one of the pressure tanks equipped with a nine foot brass rod extension. The trees are thoroughly soaked with oil on all sides before being fired, the tank with the extension being used to throw the oil as high upon the bole as possible. At the time the oil-soaked tree is fired, both tanks should be pumped to maximum pressure. Additional oil is thrown from the ordinary tank in

order to build up an intense heat at the base, and just as the flames reach the height of the oil-soaked portion of the trunk, oil is thrown from the extension, which forces the flames several feet higher. This is a simple procedure that will soon be acquired by men who are interested and show a desire to do good work. The burning-standing method of control can not be used when the tree trunks are soaked by rain or snow, or when the wind is blowing. When trees are treated under such conditions poor results follow. All burning-standing crews should be equipped with proper tools for the felling and burning of trees, primarily to treat those trees which cannot be treated satisfactorily while standing. However, when unfavorable weather conditions exist, the method of control can be promptly changed and the trees felled for treatment with no loss of time.

In the organization of treating crews it is vitally essential that adequate supervision be maintained over the burners. When these men are permitted to go out by themselves to either mark and burn trees, or to simply treat those already marked, satisfactory results will not be secured. Such supervision is essential for the proper administration and direction of the burners. The degree to which certain trees should be treated, the relocation of marked trees for treatment, the picking up of trees missed by spotters, selection of oil caches, etc., are but some of the problems requiring the superior judgment of a supervising officer. A treating crew should be organized with a foreman and as many burners and oil carriers as he can effectively supervise and keep occupied. The number of men that one foreman can supervise will be largely determined by the character of the infestation being treated.

Men should be selected for burners who are capable of exercising a certain amount of judgment relative to the treatment of the infested trees. Some trees need only the lower 8 or 10 feet of the bole treated, while it is necessary that others be treated for 40-60 feet if all of the insects are to be destroyed. Tall trees can be more effectively treated by piling debris around the base and leaning long poles against the trunk. In this manner a more intense heat is developed at the base and the flames are forced to a greater height on the bole as a result of the draft created. When trees have been previously marked it will be necessary for each burner to collect the tags from the trees and turn them over to the foreman.

Felling and Burning

In the practice of this method within the Big Hole Basin, the trees were felled, cut into logs, placed into decks and burned. A single horse was used to skid the logs into decks. Crews were organized with 1 foreman, 2 sawyers, 2 laborers, 1 driver, and 1 skid horse. The logs were placed in decks, at least 3 logs high, and when properly piled they burned very easily. Though laborious and somewhat slow, this is a rather simple though very effective method. As stated, the bole is treated to a point above where the blue stain exists, which gives a fairly easy rule for the sawyers, who buck the trees into logs, to follow. Of course, even with this method there are ample opportunities for poor work. Decks can be improperly treated or left entirely unburned, logs left unskidded, infested tops untreated, marked trees overlooked by sawyers, are but some of the items requiring adequate supervision if the work is to be effectively

performed.

In connection with the burning-standing method of control, a few trees have been felled, the infested bole sprayed with oil and then burned, which has apparently given satisfactory results. A great deal is not known about the efficiency of this method, and it should be thoroughly checked before being adopted.

Methods of Treatment to be Used

It is rather difficult to determine the method which will give the most efficient results for this project. In the writer's report relative to the Madison situation, under date of November 15, 1930, the sum of $52,000 was requested for the treatment of all the infested areas on the Madison. This sum was based upon a cost of $2.00 per tree, assuming that a large number of the trees would need be felled for treatment and, as the infestation was badly scattered in some areas, it was believed that this amount would be required. These plans, or estimates, have been subsequently reduced to included only the Black Tail Hills, most of the Ruby District, and the Wall Creek District--a total of 20,300 trees, and the cost per treatment established at $1.50 per tree. At this cost it will be necessary to treat at least half of the 20,000 trees by the burning-standing method. Though under favorable weather conditions this method is effective for short, heavily-limbed trees, or for trees where the infestation does not extend very high up the bole, it cannot be expected to give a hundred per cent cleanup within an area. There are many trees that would need be felled for treatment if all of the insects are to be destroyed. Just how a combination of these two methods will work is of course questionable, as it

has never been adequately tested, however, the writer cannot see why it should not be effective. It will be nearly impossible to set aside an area where the burning-standing method could be used alone, for though the average tree might lend itself well to this treatment, there will be many individuals associated with them that cannot be properly treated without felling.

Though the writer is not thoroughly posted as to the character of the infestation, timber types, etc., from available data it would seem that the burning-standing method could perhaps be adopted in the Black Tail Hills unit, with the understanding that all trees that cannot be thoroughly treated by this method, be felled and burned by either decking, or spraying oil along the bole. Furthermore, it would seem that in this area the infestation is so heavy that the trees should be spotted as a separate operation prior to actual treatment.

On the East Fork of Black Tail Creek, it would seem that the trees are tall, and if so, a majority of them will need be felled for treatment. If such a condition exists it would perhaps be advisable to plan on a felling method of control for this region with some spray tanks being available to pick up the scattered, scrubby trees.

The remainder of the Ruby District and the Wall District, with the exception of the Cascade unit on the Wall District, can perhaps be handled efficiently by combination spotting and treating crews. Such crews should be organized on a 6 or 8 man basis as follows: Chief of Party, combination spotters and treaters, and a packer, who must follow close behind the crew with the oil, pressure tanks, and tools for felling of tall trees. The Chief of Party runs the compass, and is responsible for the work and direction

of the crew. The 4 or 6 combination spotters and burners work on each side of the chief, each covering a strip one chain in width. The same rigid adherence to the use of the compass must be observed as when spotting crews work as a separate operation. Though in open and smooth terrain one chief spotter may be able to handle 3 spotters on either side of his course, it is believed that the smaller 6-man crew with 2 on either side of the compassman will produce far more satisfactory results. When infested trees are located, the tanks and tools are secured and the trees treated in the manner prescribed by the chief of party. A 6-man crew should have 3 pressure tanks, 1 saw, 2 axes, etc., with a supply of oil, the amount depending upon the intensity of the infestation. One horse can carry 20 gallons. As an average of 1 gallon to a tree will be required, the number of trees which will be treated on each trip from the cache will determine the amount of oil which will need be carried. On the Cascade unit of the Wall District the infestation would seem to be sufficiently heavy to justify spotting and treating as separate operations.

RECOMMENDATIONS FOR MADISON CONTROL PROJECT

There are factors in connection with this project that are of such importance as to warrant special mention within this plan. These factors have been emphasized in the following recommendations:

1. The entire project should be organized on a basis of attempting to secure as near a 100% cleanup of the infestation as is humanly possible with the funds available.

2. The importance of spotting must be thoroughly emphasized to make it as near 100% effective as possible. Spotting must under all circumstances be on the basis of a 100% coverage. This can only be accomplished

by an actual stripping of all areas. This strip must not exceed more than one chain in width, except under the direct authority of the project manager, who will assume responsibility. The use of a compass for the running of strip will be found to be most satisfactory in producing more efficient results.

3. Every possible effort must be made on the part of the camp manager to extend his operations into the extreme edges of his unit in order that no small patches of infestation will be overlooked. He must also thoroughly familiarize himself with the status of conditions within the areas adjacent to his unit where no control measures are being conducted.

4. The treatment of the infested trees should be thoroughly performed. The economic burning-standing method of control has its field in the treatment of trees that can be successfully burned to a 6-8 inch top or to the height of the infested length, when this fact can be positively determined. All trees that cannot be thoroughly treated by this method should be felled for treatment. Trees felled should be treated by piling the infested logs into decks for burning, or, if found effective, by spraying oil along the infested portion of the bole and then burning. There should be no departure from this rule, and adequate supervision must be given to the treating crews in order to be assured that this provision of the project is being executed.

5. The first camp should be started one week in advance of all others and considered as a training camp. Project manager, camp managers, chief spotters, crew foremen, and as many spotters as possible should be assembled in this camp for training. These men should be engaged in the actual operation of spotting and treating before being released to assume their duties

in other camps. Officers of the Bureau of Entomology will attend this camp to assist in the training of these men. Regardless of what previous experience any of these men may have had they should attend this camp. In the past men have been sent into the field charged with the responsibility of operation spotting and treating crews who have not been properly trained. This mistake should not occur in the future.

In explanation as to why such thoroughness in the spotting and treating is being emphasized, it must be understood that a tree left untreated becomes a potential source of reinfestation from which sufficient insects will emerge to attack 3 or 5 trees during the following season. Furthermore, to accurately determine the part which flights of insects into the control units from the heavily infested areas on the Beaverhead are playing, it is necessary that all sources of infestation within the project areas be eliminated.

FORMS AND RECORDS

There is a natural tendency on the part of many people to object to the execution of forms. Forms are often interpreted as requiring additional clerical labor. The forms as outlined in this plan, have been developed with the idea of assisting the men charged with the responsibility of recording certain data which are essential in the prosecution of the project, and will be found to require but little time for their execution. These forms have been used before, found satisfactory, and provide an easy method of recording data. However, the value of such reports lies in their being kept up-to-date and in their prompt submission. A discussion of the use and preparation of the various forms follows:

Marking Tags

A sample tag that has been satisfactorily used in marking trees for treatment is shown on Page A. This tag is made from sign painter's cloth and should be approximately 4x6 inches in size. It is possible that other material can be used that will be equally if not more satisfactory. The tags will be prepared by the spotters so as to show the symbol of the spotting crew, i.e. "A", "B", "C", etc.; tree number (195), and the initials of the spotter in the lower righthand corner. The crew symbol and the spotter's initials are placed on the tags by the spotters before going into the field. The lettering should be an inch or more below the top of the tag so that when it is torn from the tree the data will not be destroyed. At the time the tree is treated the tag is removed by the burner. These tags are preserved, turned over to the crew foreman for the preparation of his daily report.

Maps

Standard map sheets (Form 878) are used in the preparation of the spotters' maps. They must be carefully and accurately prepared. It is from these maps that the marked trees are relocated for treatment. An error in the construction of these maps may result in a treating crew marking time for several hours or cause the treating crew foreman unnecessary time and labor in relocating the trees marked. Extra care and thoroughness may save hours of nonproductive labor. If the region has been surveyed and the spotting is being conducted from section lines, then only one section or part thereof should be shown on each sheet. Only essential data that will prove of real benefit in helping to relocate the trees should be placed on the map. Trails, streams, ridges, peaks, fences, cabins, telephone lines, etc., are some of the features that

should be shown, while little details of no value should be omitted. The number of maps required will vary for each area, and a decision from the project manager will often be necessary. A sample map is shown on Page B.

Spotter's Daily Report

This form, as shown on Page C, is used by the chief spotter for the purpose of keeping a record of the tree numbers used during the course of the day by his spotting crew. These numbers, which are kept consecutively are placed on the form before going into the field. As a number is given to a spotter it is checked off in the column marked "S", which means spotted. At the close of each day this form is turned in to the camp manager who checks off in the column marked "T", all tree numbers turned by the crew foreman as treated. It is in this way that the camp manager can determine if any marked trees have been missed by the treating crews. The following day the chief spotter starts his sheet with the next number following the last one given out on the previous day. Scale books, having consecutive numbers already printed, have been used in a satisfactorily manner for the Spotter's Daily Report.

Spotter's Weekly Report

This form is prepared by the chief of each spotting crew for the purpose of reporting the results accomplished during the past week, as well as to give general information relative to the amount of territory remaining to be covered from the present camp and the amount of time required to complete the spotting. When areas are spotted in advance of the treating crews, suggestions as to the proper location of control camps so that they will be centrally located to the trees marked are of value. In order to keep an accurate record of spotting costs, it is necessary to

show in the column marked "Man Days" the number of effective man days for each day worked. This report is prepared in duplicate as copies are required for both the project and camp managers. A sample of this form is shown on Page D.

Crew Foreman's Daily Report

This form will be used by the crew foreman of each group of burners, or of a felling and burning crew, in tabulating the daily output of his crew. An attempt has been made to prepare a form which may be used for either method of control, or for a combination of the two. When the burning-standing method is used, the names of the burners should be listed in the column captioned "Burner". When burners are working in pairs, they should be so listed. At the bottom of the page will be shown the number of trees treated, with total number of crew man days. The item of crew man days should include crew foreman, laborers, oil carriers or packers, but only those men who are an actual part of the crew organization. With these data the trees per man day can be easily computed, which serves as an excellent basis for determining the crew production.

Though not entirely satisfactory, this form can be adapted to care for the crew foreman's daily report regardless of the method, or combination of methods, used. A sample of this form is shown on page E.

Camp Manager's Weekly Report

This form is used by the camp manager in submitting a weekly report to the project manager covering the activities of his camp. On this form he will show the daily record of the different treating crews. In the space captioned "Trees Treated" he will insert the crew foreman's name and give for each day the total number of trees treated. He will also show in the proper space the number of meals served; number of effective man

days treating; number of effective man days spotting; number of all other man days in camp; total number of man days paid; and total number of man days contributed. The total man days paid with the total man days contributed should equal the effective and noneffective labor for each week. Information relative to personnel, equipment, etc., should be shown under "Remarks". A sample of this form is shown on Page F.

Camp Production Record

Though not at all essential it is sometimes of interest for the camp manager to keep a chronological record of the daily output of his camp, and trees per effective man days, or any other information which the camp manager might desire to include to show the production or progress of the work in his camp.

Truck and Horse Reports

Standard forms which are in use by the respective Forests should be used in keeping a record of transportation charges. It has been found that transportation often proves to be one of the items of cost which is entirely out of proportion with the other expenditures of the project. From an analysis of accurate truck and pack stock records, it will often be found that such excessive charges can be eliminated in the future by more careful ordering of supplies, transportation of men, etc.

Cost Keeping

In order that an analysis can be made of the cost of the various activities which go to make up a control project, it is necessary that a more detailed accounting be maintained than that which is usually practiced for more firmly established forest projects. Such an analysis is believed to be essential in order that improvements in technic of application and administration can be effected. It is desired, however,

that this cost keeping be reconciled to the system practiced by the Forest Service. Detailed costs are required for the following:

Spotting	Equipment and Supplies
Treating	Transportation
Overhead	Subsistence
Camps	Other or Miscellaneous

Any method of accounting which will show these itemized costs will be satisfactory.

Time Reports

The standard time report (Form D.1-40) will be used in keeping the time of all men employed on the project. On this form the different activities on which a man is engaged will be listed under "Projects or Activities" and the time he spends charged against them. The total time, rate, and amount earned are extended and totaled as the sample form on Page G. Commissary and charges for board are deducted from the total amount earned and shown as Net Due.

LIST OF FORMS AND BY WHOM SUBMITTED

Forms	Submitted	Sample Page
Marking Tags	Chief Spotter	A
Spotter's Maps	Chief Spotter	B
Spotter's Daily Report	Chief Spotter	C
Spotter's Weekly Report	Chief Spotter	D
Crew Foreman's Daily Report	Treating Crew Foreman	E
Camp Manager's Weekly Report	Camp Manager	F
Truck and Horse Reports	Operator	--
Time Reports	Camp Manager	G

CONCLUSIONS

The first reaction one may secure from reading this plan is that there are a lot of forms to be executed and that some unnecessary data have been called for which will add materially to the cost of the project. This, however, is not the case. All the data which have been called for will be found of value in the proper administration of the project. Re-

lative to the time required for the preparation of the reports it has been found that the men who are responsible for their submission prepare them after hours at no cost to the project. The method as given for the keeping of project costs will no doubt entail additional labor on the part of the clerk responsible for vouchering bills, etc. However, it is believed this additional effort will be more than compensated for in the value of the information secured. Such data are essential if one attempts to make a detailed analysis of the cost of a project.

These forms have been prepared for the recording of essential data on projects where the spotting and treating are conducted as separate operations. When the operations of spotting and treating are combined, the Spotter's Weekly Report will be found to be well adapted to the recording of essential data. "Number of Trees Spotted" can easily be changed to "Number of Trees Treated". This form should be turned in to the camp manager at the close of each day's work.

Respectfully submitted,

James C. Evenden, Entomologist.

Marking Tag

Tack

322

JB

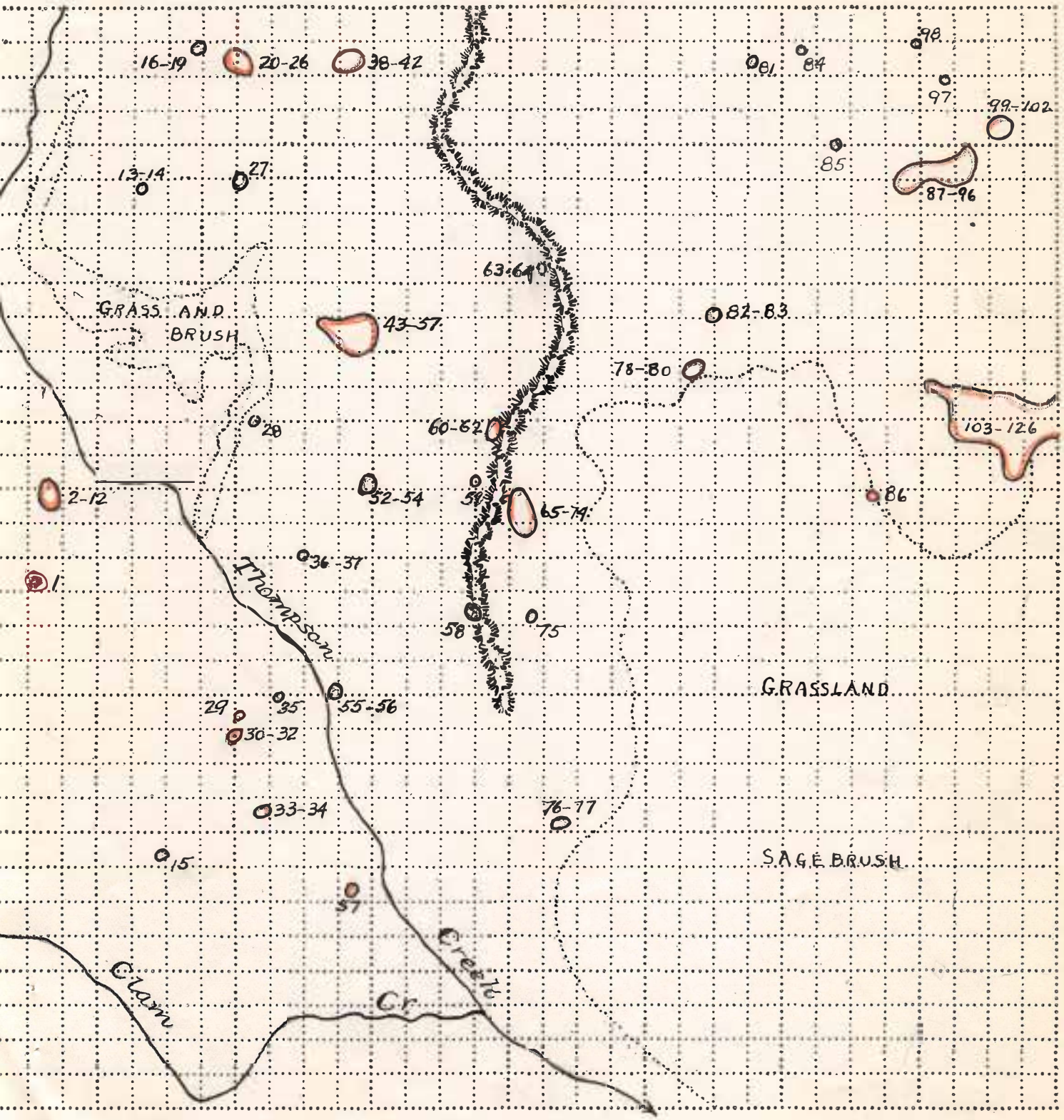
A

UNITED STATES DEPARTMENT OF AGRICULTURE—FOREST SERVICE

..... Land District. Mag. Declin. ..... Area ..... Acres

..... , SEC. 30 T. 1 N. R. 15 W Mer. Scale 8 inches = 1 mile

(Case designation) (Subdivision and section)



Field work by ....., Date JUNE 12, 1928, Platted by PETERSON

Remarks: NO. OF TREES 126

..... Approved ....., 19....., ...

(Approving officer.)

Form 878
(Revised Aug., 1925)

GOVERNMENT PRINTING OFFICE

8—433

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620

I.C. Form ~~"E"~~ A

SPOTTERS DAILY RECORD

Project area Unit Camp No.

Date Spotter T. R. Sec.

S	Tree No.	T	S	Tree No.	T	S	Tree No.	T	S	Tree No.	T

I.C. Form B

1931

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SPOTTER'S WEEKLY REPORT

Week of _____ to _____ Crew Symbol _____

Camp _____ Unit or Forest _____

Record of Trees Marked for Treatment

Date	Number of Trees Spotted	Section or area Worked	Man Days	Area ~~Remarks~~	Remarks
S					
M					
T					
W					
T					
F					
S					
Total					

Remaining territory to be covered from present camp _____

Number of days required to complete present camp area _____

Suggestions as to location of control camp in present area _____

Suggestions as to new location for spotter's camp _____

Remarks. (Suggestions, Requirements, Etc.) _____

Signed _____

Chief of Spotting Crew

I.C. Form C.

1931

1220

CREW FOREMAN'S DAILY REPORT

Camp_____ Area_____ Forest_____

Date_____ Horse Days_____

_____
Signature Crew Foreman.

Burner or Crew	Number of Trees Treated	Man Days	~~Remarks~~ Method of Treatment

Total Trees Treated_____

Total Crew Man Days_____

Total Trees per Man Day_____

Remarks_____

_____

_____

_____

E

I.C. Form D

1931

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CAMP MANAGER'S WEEKLY REPORT

Forest _____ Unit _____ Camp _____

Production Record for Week of _____ to _____

Day	Trees Treated	Crew Man Days	Trees Treated	Crew Man Days	Trees Treated	Crew Man Days
S						
M						
T						
W						
T						
F						
S						
Total						

Grand total trees spotted _____ Grand total trees treated _____

Meals Served	
Day	Number
S	
M	
T	
W	
T	
F	
S	
Total	

A. Total effective man-days treating _____

B. Total effective man-days spotting _____

C. All other man-days _____

D. Total man-days paid _____

E. Total man-days contributed _____

A., B., & C. should equal D. and E.

Remarks: _____

Signed _____
Camp Manager

A. Includes Crew Foreman and all men contributing to the actual treating of trees.
B. Includes Chief Spotter and all men of spotting crew.
C. Includes Camp Manager, Cooks, Flunkey, Bull Cook, etc.
D. All man-days paid from project funds.
E. All contributed man-days except supervising overhead not attached to camp.

F

Form D. 1-10

TIME REPORT

Coeur d'Alene Forest

Steamboat Control Project Ranger District

Employee transferred from ..... { Crew / District

to ..... { Crew / District on ....., 19....

May (Month)

1931 (Year)

Name Smith, John A.
(Print name same as spelled by employee)

Send check to { 123 Rose Ave., Spokane, Wn.

	Date	Remarks
Laid off		
Quit		
Discharged		

DAILY TIME RECORD

PROJECT, or activity if no project involved	Title	Appropriation	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total time	Rate	Amount earned	Deductions	Net due
Spotting	Spotter						8	8	8	8	8	8					4	8	8	8			8	8	8			8	8					14½	4.00	58 00		
Treating													8	8	8															8	8	8	8	7	4.00	28 00		
Moving camp																8	4																	1½	4.00	6 00		
Flunkey																					8	8												2	4.00	8 00		
Truck Driver																										8	8							2	4.00	8 00		
Totals																																				108 00	33 00	75 00
Off duty without pay																																						

Date	Itemized Charge Account, Commissary	Deduct from pay
	Sox	1 00
	Shoes	5 00
	Board 5th to 31st. 27 days @$1.00	27 00
	Total	33 00

Other (Board, Transportation, etc.)

Received	Returned	Property	Value

I certify that I have received the supplies itemized herein and that the commissary, property, and other charges are correct and time as itemized is correct.

(Signature) X .....
(Employee)

I certify this to be a true statement of the charge account and time as shown by my records.

(Signature) X .....
(Timekeeper)

Approved X .....
(Forest officer)

INSTRUCTIONS

Indicate time, in hours, for which pay is to be received each day in spaces provided for daily entries. Do not overlook 31st day. Enter Leave Without Pay in last line of daily record.

If employee is transferred from your job or district, complete his time report to the time he finishes work for you, cross rule unused part of report, obtain employee's signature, make notation of transfer, sign report, and forward original to Supervisor's office and duplicate to new timekeeper.

Paid in cash by S. D. F. A. .....

Date ..... Check No. ..... $.....

8—7059

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